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Morphological Changes of Poly(d,l-lactide-co-glycolide)/Hydroxyapatite (PLGA/HAP) Particles with Loaded Clindamycin During Degradation Process

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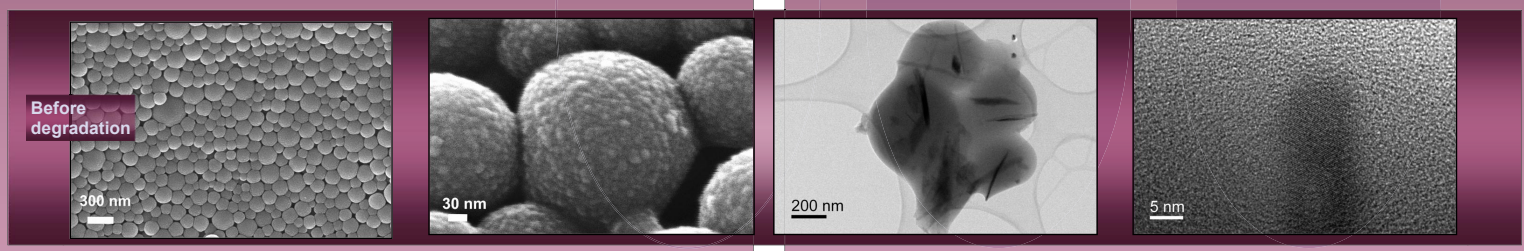
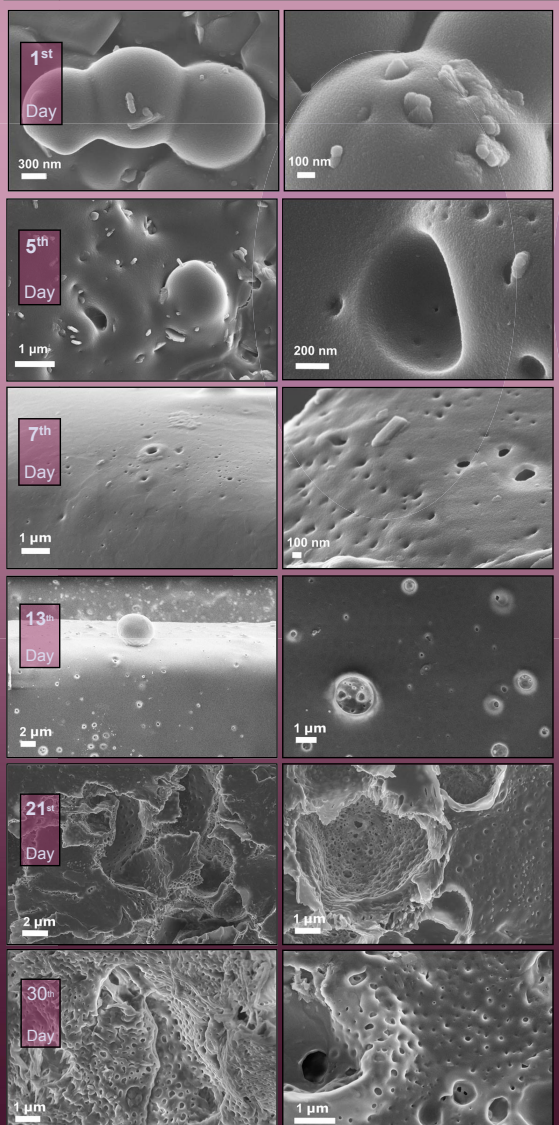
INTRODUCTION

The main advantages of the application of controlled drug delivery are related to high medication efficiency, comfortable medication treatment, low probability for side effects and fast healing/low medication price. To obtain maximal benefits of this type of medication properties of the drug carrier and the way of release of the drug should be analyzed in details and adjusted to potential applications.

AIM

In this work, PLGA/HAp composite particles formed from biocompatible polymeric and osteoconductive ceramic phases were selected as carriers of clindamycin, antibiotic which is usually applied for the treatment of infectious bone tissue diseases. The main aim of this part of monitoring of the degradation process under physiological conditions was related to morphological changes of particles as drug carriers.

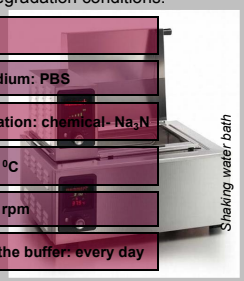




EXPERIMENTAL PART

Degradation conditions:

- pH value: 7.4
- Degradation medium: PBS
- Type of conservation: chemical- Na_3N
- Temperature: 37 ^{0}C
- Shaking rate: 60 rpm
- Replacement of the buffer: every day



RESULTS and DISCUSSION

It was observed that primary formed sphere-like morphology of PLGA/HAp/clindamycin particles was changed fast. During the first day of degradation particles tend to aggregate, started to ingrowth into larger spheres and appearance of rod-like HAp was observed. During the next four days secondary formed sphere-like particles further changed its morphology into film-like structures. After the final formation of films, they were turned into porous structures with uniform distribution of size and shape of pores until the whole 30-days degradation period was finished. In addition to formation of surface, bulk pores were observed too. In the same time macromolecular properties of PLGA were changed very slow with the time of degradation.

CONCLUSIONS

Morphological changes of PLGA/HAp/clindamycin particles indicate two mechanisms of degradation followed by release of the drug: (i) diffusion controlled by macromolecular interactions and (ii) surface and bulk erosions. These mechanisms allow control over the drug concentration within surrounding medium.

Sample	Degradation time (days)	Surface area (m^2/g)
1	0	8.9
2	5	0.3
3	7	No signal
4	13	No signal
5	21	26.6
6	30	70.9